Chapter 4

Infiltration and Inflow

The RWSP calls for improvements to reduce existing and future levels of infiltration and inflow (I/I) into local collection systems. I/I is clean storm and groundwater that enter the sewer system through cracked pipes, leaky manholes, or improperly connected storm drains, down spouts, and sump pumps. Most inflow comes from stormwater and most infiltration comes from groundwater. I/I affects the size of King County conveyance and treatment systems and, ultimately, the rate that businesses and residents pay to operate and maintain them.

The RWSP I/I policies direct the county to carry out pilot rehabilitation projects to demonstrate the effectiveness of I/I control in the local sewer systems tributary to the regional system. In response to these policies, the county and local agencies that contribute wastewater to the King County system completed a comprehensive six-year study in 2005 of I/I in the portions of the regional wastewater service area served by separated sewers. The study consisted of four key elements:

- Region-wide flow monitoring during the winter months of 2000–2001 and 2001–2002
- Ten pilot I/I reduction projects completed in 2004
- A Regional Needs Assessment conducted in 2005 to identify needed conveyance system improvement (CSI) projects, the year they would be needed, and their cost
- A benefit-cost analysis completed in 2005 to compare the costs of I/I reduction in areas where needed CSI projects were identified to the cost of the identified CSI projects

The results of the study were used to prepare the *Executive's Recommended Regional Infiltration and Inflow Control Program* for review and approval by the Regional Water Quality Committee (RWQC) and the Metropolitan King County Council. The council approved the recommended I/I program in May 2006 via adoption of Motion 12292.

This chapter presents the recommended I/I control program and describes the two elements of the I/I control study completed in 2005—the Regional Needs Assessment and the benefit-cost analysis.[1] The last section of the chapter presents schedule information for 2006.

[1] Information related to flow monitoring and the completion of the 10 pilot projects was reported in previous RWSP annual reports.

4.1 Executive's Recommended I/I Control Program

The *Executive's Recommended Regional I/I Control Program* includes recommendations for I/I reduction, long-term I/I control, and program administration and policy. The recommendations represent the consensus reached by the county and local agencies throughout the six-year program development process.

Recommendation Highlights

King County and the local agencies would select, implement, and evaluate two or three "initial" I/I reduction projects to test the effectiveness of I/I reduction on a larger scale than the pilot projects.

After completion of the initial projects, recommendations would be made to the King County Council regarding long-term I/I reduction and control, including applicable changes to policy or code.

The recommendations reflect the need to reduce I/I by cost-effectively removing enough I/I from the collection system to delay, reduce, or eliminate some otherwise needed CSI projects. The recommendations also reflect the need to maintain I/I reductions long-term to prevent future increases in I/I throughout the regional system. Long-term I/I control includes policy, administrative, financial, and technical measures that promote an ongoing program of review, maintenance, and repair of the collection and conveyance system.

The following sections list the I/I control program recommendations for I/I reduction, long-term I/I control, and I/I control program administration and policy.

4.1.1 Recommendations for I/I Reduction

- Identify cost-effective I/I reduction projects on a project-specific basis, rather than on a regional basis or by the need to meet specific I/I reduction targets.
- Select two or three initial I/I reduction projects for implementation from the list of nine cost-effective projects identified in the benefit-cost analysis. King County and the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC), through its Engineering & Planning (E&P) Subcommittee would work cooperatively to select these projects.
- In the next 3 to 5 years, construct the selected initial projects to test planning assumptions and gain more information about costs.
- Proceed with work on private property when a project calls for it. Experiences on initial projects would be documented in terms of public involvement activities, private property participation rates, costs, neighborhood impacts, groundwater effects, and special construction issues that arise.
- Fund initial projects through King County wastewater revenue that is dedicated to funding CSI projects in the regional conveyance system. For future I/I reduction projects, options to supplement King County funding may be considered. For example, local agencies could contribute funds to expand the project scope in order to take advantage of

construction efficiencies, as was done in some pilot projects, or to move a project into the cost-effective category.

- Conduct pre- and post-project flow monitoring to test the ability of I/I reduction projects to reduce enough flow to delay, downsize, or eliminate the need for CSI projects.
- Reconvene the E&P Subcommittee when initial projects and post-project flow monitoring are completed to evaluate results of projects, adjust planning assumptions if appropriate, and further refine private property protocols or best practices to ensure that successful approaches are carried forward to future work.
- If the initial projects are deemed successful and future I/I reduction is approved, proceed programmatically to apply I/I reduction planning to all CSI project planning. Wherever an I/I reduction project is a cost-effective alternative to the planned CSI project, the county and local agencies would implement the I/I reduction project provided that it is environmentally and logistically feasible.

4.1.2 Recommendations for Long-Term I/I Control

- Make use of existing local agency regulations to ensure that new development and redevelopment within the regional wastewater service area meet up-to-date construction standards for sewer conveyance lines and connections.
- Apply the standards, guidelines, procedures, and policies in final draft form to the initial I/I reduction projects (included as Appendix A in the Executive's Recommended I/I Control Program). Once they have been tested on large-scale projects, the standards, guidelines, procedures, and policies would be reviewed and finalized by the local agencies and translated into King County policy in the form of an ordinance.
- Conduct a system flow audit of the regional and local systems every 10 years to track I/I levels. The county and local agencies would conduct the audits and use the information to cooperatively make decisions about how to adjust I/I control measures as may be necessary.
- Do not implement a surcharge on local agencies for flows that exceed targeted I/I reduction levels already established in the King County Code. The county and local agencies found that implementing a surcharge, as contemplated in the King County Code, would be costly to administer and would pose difficulties in verifying violations.

4.1.3 Recommendations for Program Administration and Policy

- Authorize King County to centrally manage the I/I control program, to develop public information materials for the overall program, and to serve as a central clearinghouse for program inquiries and training.
- Conduct flow monitoring to assess effectiveness of I/I reduction over time.

- After completion of the initial I/I reduction projects, develop recommendations regarding changes to local agency agreements and/or the King County Code.

The Executive's Recommended Regional Infiltration and Inflow Control Program report is available on the Web at http://dnr.metrokc.gov/wtd/i-i/library/ExecRec/report.htm.

4.2 Regional Needs Assessment

The Regional Needs Assessment was completed in March 2005. The assessment used projections of regional population growth and I/I generation to identify portions of the regional conveyance system that will require expansion over time.

Sixty-three CSI projects were identified to meet the region's projected peak flow capacity needs through 2050. These projects and their estimated costs provided the basis for conducting benefit-cost analyses of potential I/I reduction projects. The list of identified CSI projects is provided as Appendix A; locations of CSI projects are shown in Figure 4-1.

The Regional Needs Assessment is available on the Web at http://dnr.metrokc.gov/wtd/i-i/library/NeedsAssess/report.htm.

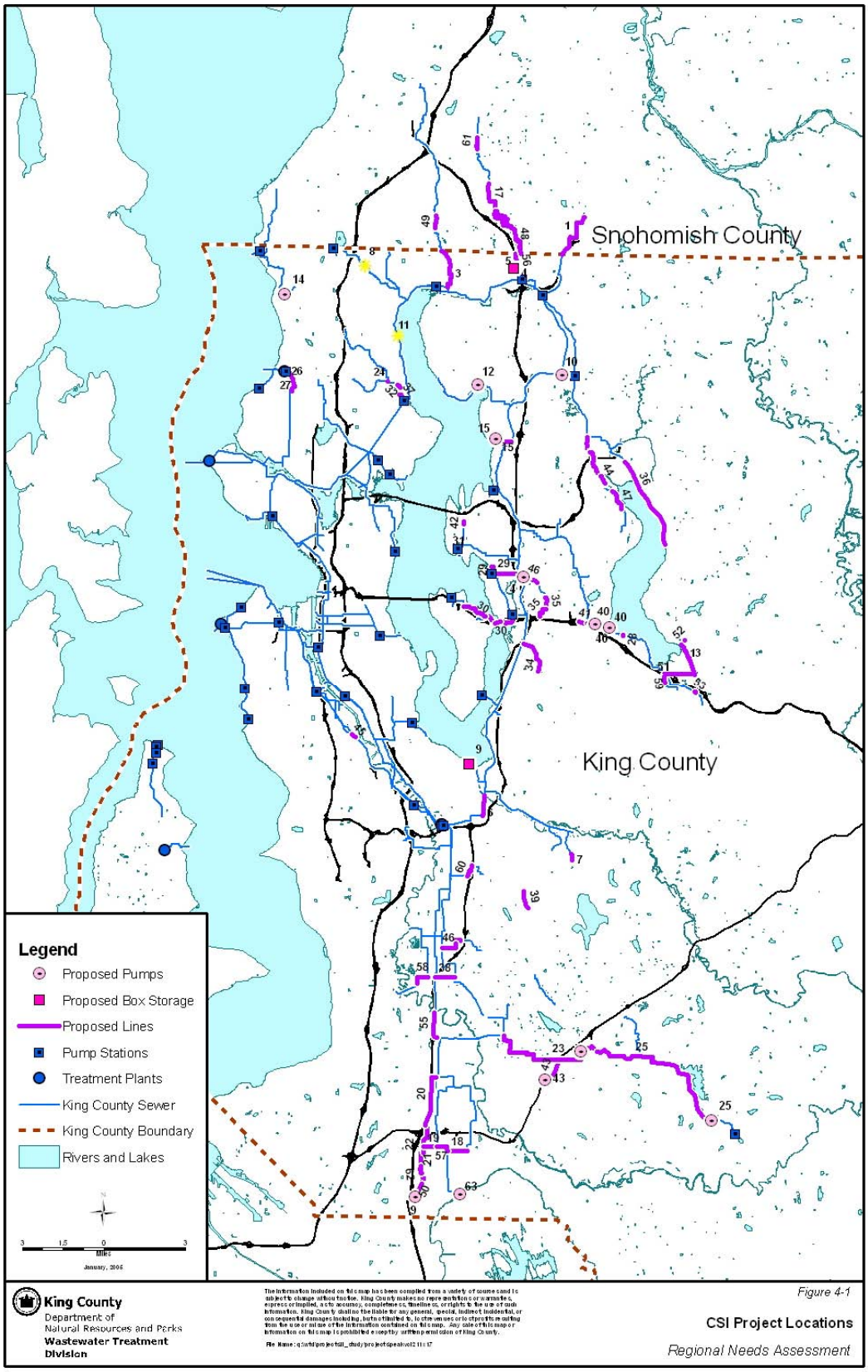

Figure 4-1. Conveyance System Improvement Project Locations

4.3 Benefit-Cost Analysis

To make the most effective use of county resources, the Wastewater Treatment Division (WTD) evaluated whether it would be cost effective to eliminate or delay CSI projects identified in the Regional Needs Assessment by reducing the amount of I/I in the conveyance system. The benefit-cost analysis compared the estimated costs of constructing CSI projects with the estimated costs of I/I reduction projects.

To evaluate cost-effectiveness of I/I reduction projects, the following benefit-cost ratio was calculated for each candidate CSI project:

$$\frac{\textbf{(CSI Project Savings After I/I Reduction)}}{\textbf{(Cost of Proposed I/I Reduction Project)}}$$

When an I/I reduction project delays, downsizes, or eliminates the need for a conveyance facility improvement, the savings achieved (benefit) must be higher than the cost of the I/I reduction project (cost) to arrive at a positive benefit-cost ratio.

Table 4-1 summarizes the nine resulting cost-effective I/I reduction projects. The two or three initial I/I reduction projects will be selected from this list. (See the I/I control program recommendations listed earlier in this chapter for more detail about the initial projects.)

Table 4-1. Cost-Effective I/I Reduction Projects

CSI Project No.	Project	I/I Available (mgd)	I/I Reduction (mgd)	Benefit: Capital CSI Cost Reduction	Cost: I/I Reduction Project	Benefit -Cost Ratio	No. of Private Properties
60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	$7,270,000	$2,217,645	3.3	119
58	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	$2,410,000	$999,123	2.4	101
55	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	$22,990,000	$11,362,511	2.0	1,176
59	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))[a]	5.4	1.05	$5,770,000	$3,964,850	1.5	395
33	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	$8,510,000	$6,018,534	1.4	557
47	Lk Hills Trunk 3rd Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	$14,438,000	$11,307,052	1.3	1,086
41	Eastgate Storage and Trunk[b] (Eastgate Tube Storage)[a]	8.7	3.55	$16,629,000	$14,459,862	1.2	1,163
35	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	$12,058,000	$10,550,378	1.1	976
46	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	$13,660,000	$12,013,489	1.1	1,275
	TOTAL	**122.5**	**22.11**	**$103,735,000**	**$72,893,444**		**6,848**

Note: Identified projects are based on E&P Subcommittee–approved assumptions.

[a] The Eastgate Tube Storage and RE*ISSAQ2.R17-40(3) projects are related and are considered as one construction project.

[b] Modeling for the Eastgate trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate storage facility.

The benefit-cost analysis report is available on the Web at
http://dnr.metrokc.gov/wtd/i-i/library/BenefitCost/report.htm

4.4 Schedule for 2006

A major milestone for the I/I control program in 2006 is to begin implementing the council-approved regional I/I control program. The first step is to work with the local agencies to select two or three cost-effective I/I reduction projects for implementation in 2007. For each project, sewer system evaluation surveys will be conducted at the project sites to identify specific points in local agency sewers and in privately owned side sewers where I/I is entering the sewer system. The information from these surveys will help determine the level of effort necessary to reduce I/I to a point where a larger conveyance facility will no longer be needed and will help identify the appropriate repair technologies for each rehabilitation project.

Visit the project Web site for more information: http://dnr.metrokc.gov/wtd/i-i/